

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE (DD-MM-YYYY) 2. REPORT TYPE Technical Papers 3. DATES COVERED (From - To)

4. TITLE AND SUBTITLE 5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

6. AUTHOR(S) Please see attached

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Air Force Research Laboratory (AFMC)

AFRL/PRS

5 Pollux Drive

Edwards AFB CA 93524-7048

8. PERFORMING ORGANIZATION REPORT

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Air Force Research Laboratory (AFMC)

AFRL/PRS

5 Pollux Drive

Edwards AFB CA 93524-7048

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S NUMBER(S)

Please see attached

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

20030129 194

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:

17. LIMITATION OF ABSTRACT

18. NUMBER OF PAGES

19a. NAME OF RESPONSIBLE PERSON

Leilani Richardson

19b. TELEPHONE NUMBER (include area code)

(661) 275-5015

a. REPORT
Unclassified

b. ABSTRACT
Unclassified

c. THIS PAGE
Unclassified

A

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

22 May 2002

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2002-128**
C.T. Liu (PRSM), "Investigating the Effects of Specimen Thickness and Pressure on the Crack Growth Behavior of a Particulate Composite Material"

ASME Winter Meeting
(Blacksburg, VA, 24-28 June 2002) (Deadline = 19 June 2002)

(Statement A)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.

Comments: _____

Signature _____ Date _____

2. This request has been reviewed by the Public Affairs Office for: a.) appropriateness for public release and/or b) possible higher headquarters review.

Comments: _____

Signature _____ Date _____

3. This request has been reviewed by the STINFO for: a.) changes if approved as amended, b) appropriateness of references, if applicable; and c.) format and completion of meeting clearance form if required

Comments: _____

Signature _____ Date _____

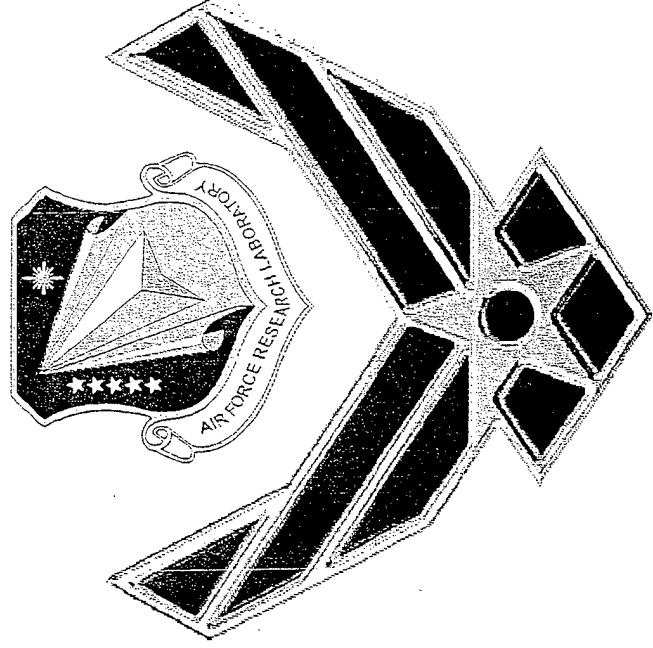
4. This request has been reviewed by PR for: a.) technical accuracy, b.) appropriateness for audience, c.) appropriateness of distribution statement, d.) technical sensitivity and economic sensitivity, e.) military/national critical technology, and f.) data rights and patentability

Comments: _____

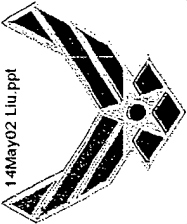
APPROVED/APPROVED AS AMENDED/DISAPPROVED

PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

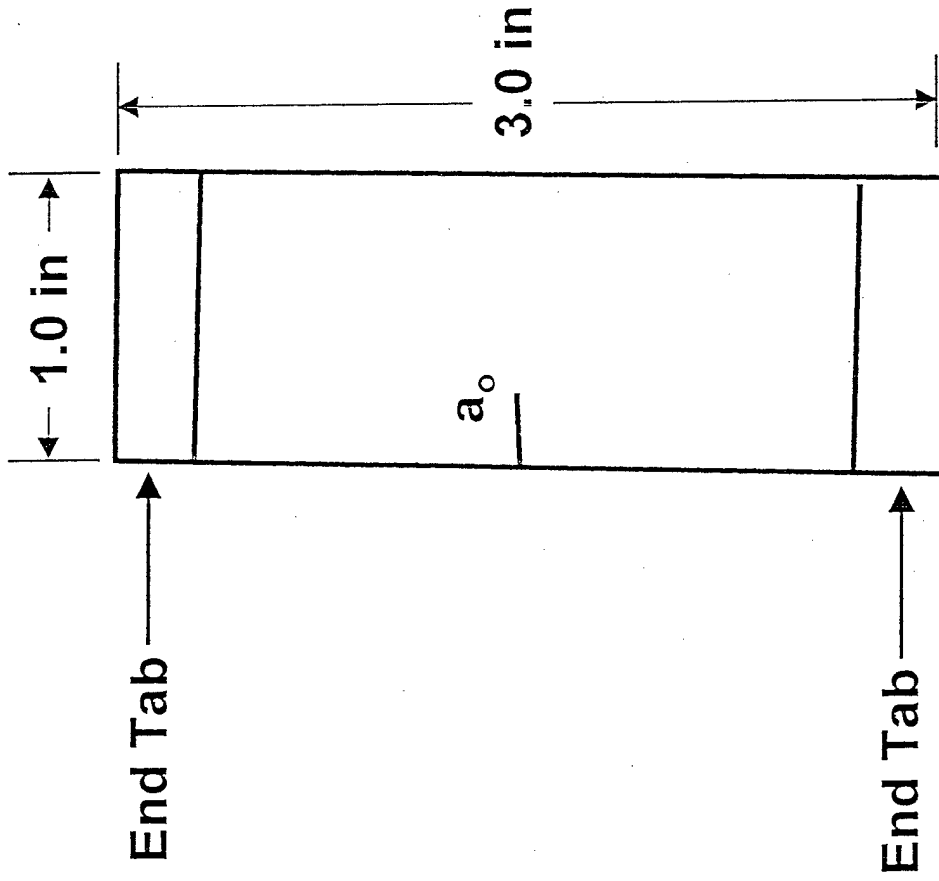
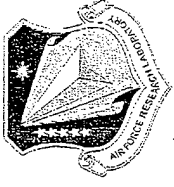
Investigating the Effects of Specimen Thickness and Pressure on the Crack Growth Behavior of a Particulate Composite Material

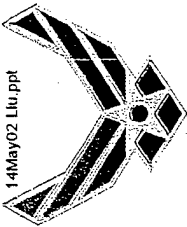


C. T. Liu
Principal Research Engineer
PRSM
Air Force Research Laboratory

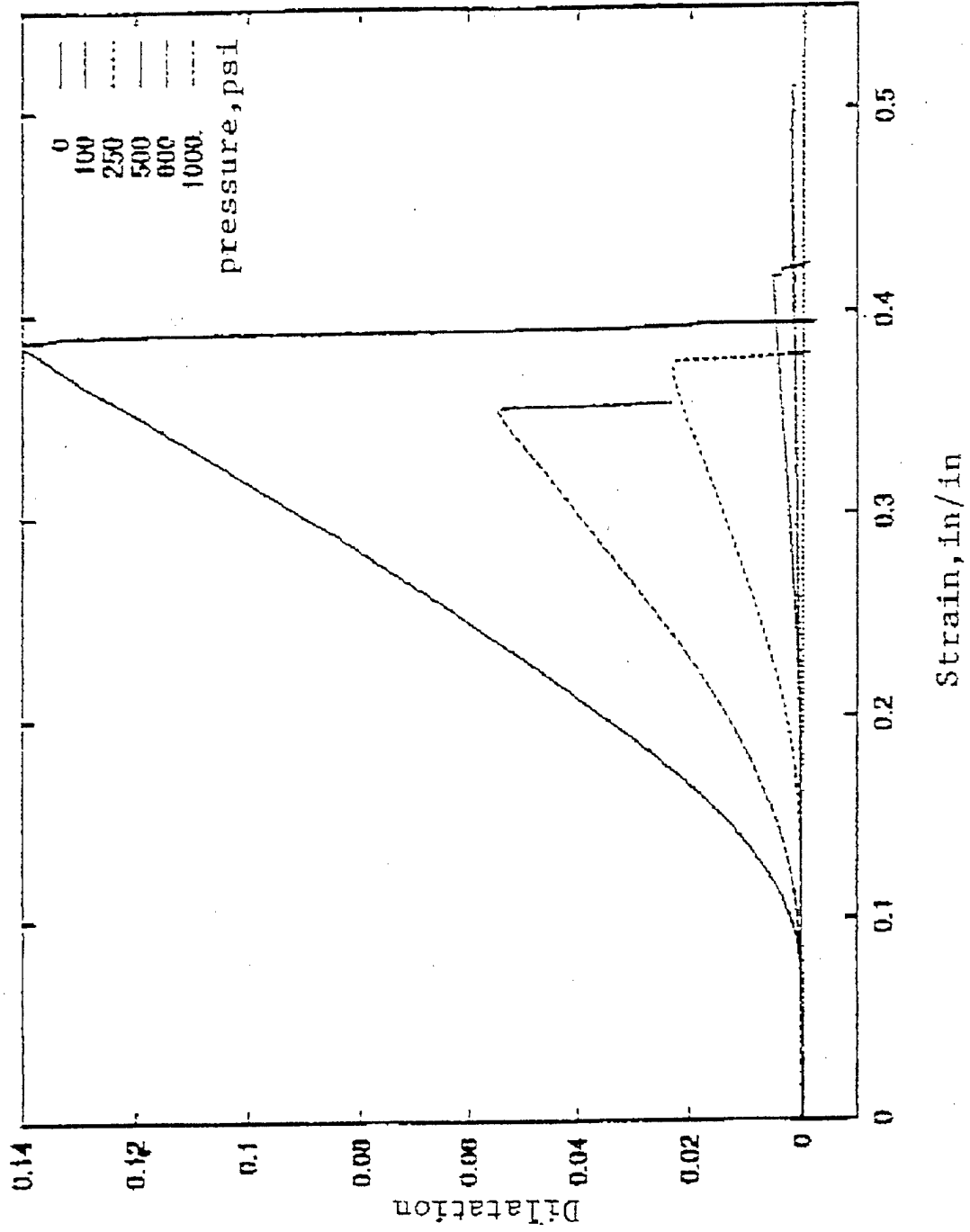


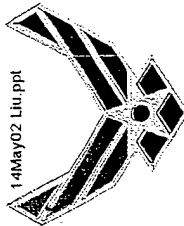
Specimen Geometry



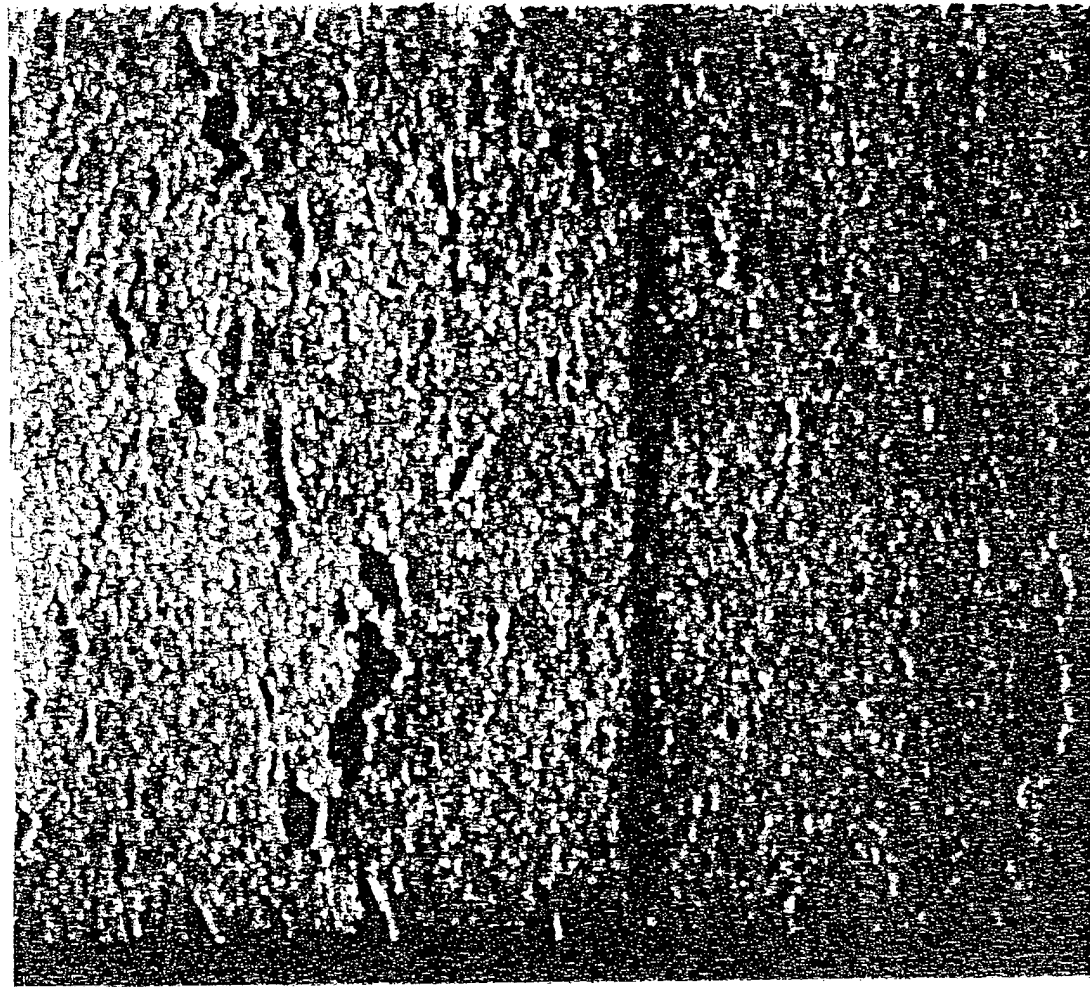


Volume Dilatation vs. Pressure

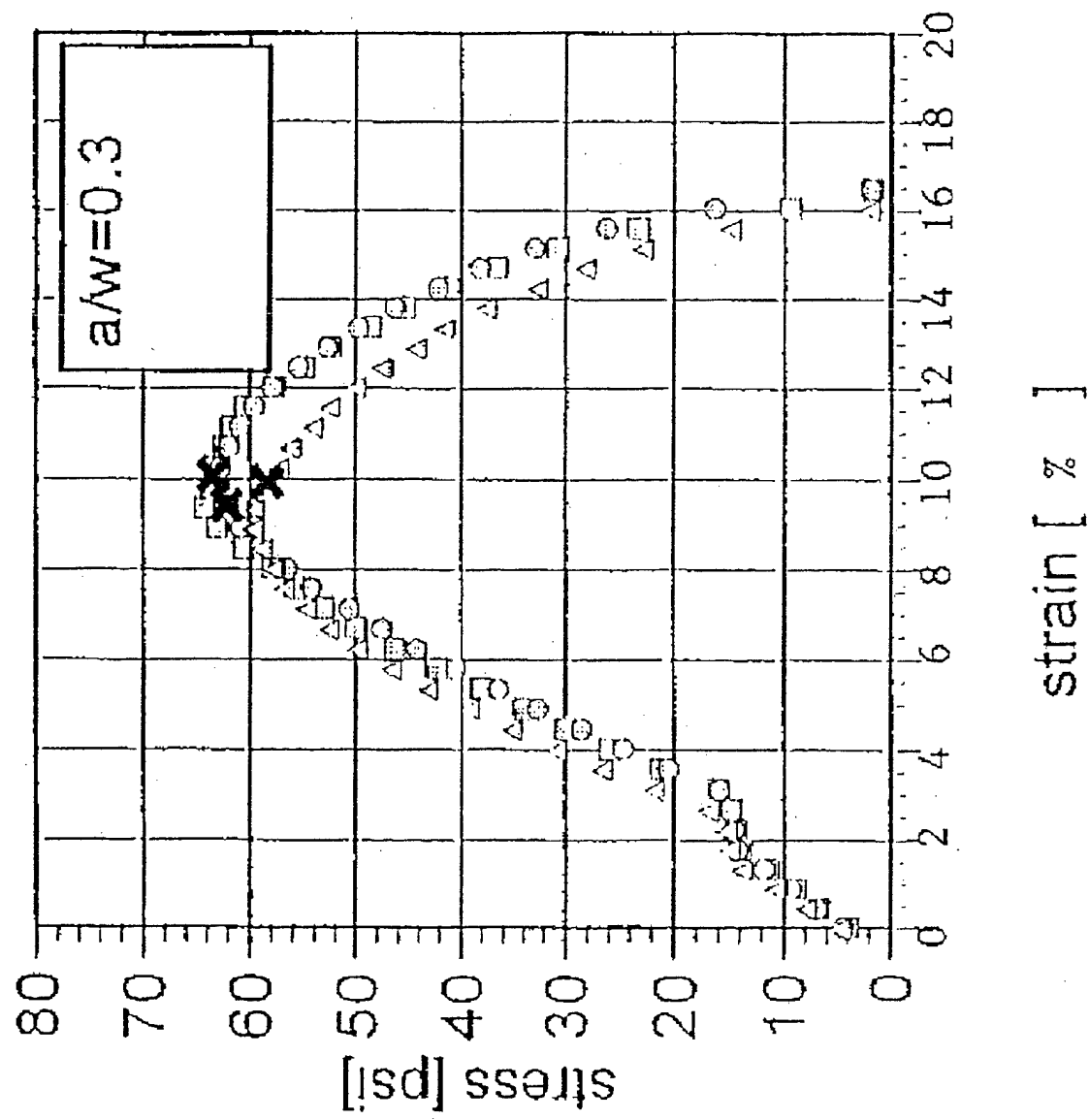


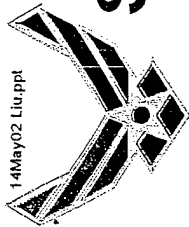


Microcracks in the Specimen under Pressure



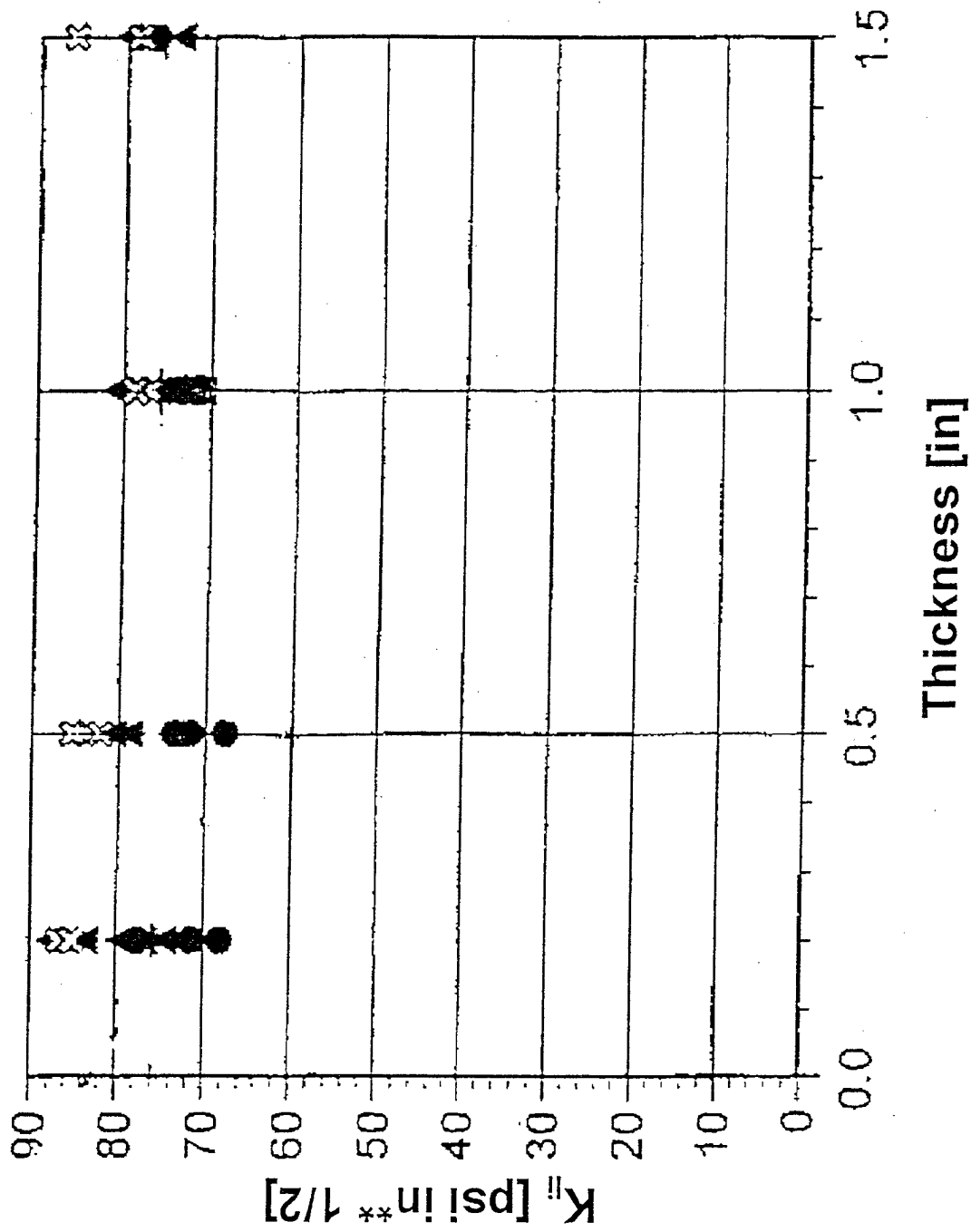
Stress-Strain Curves under Ambient Pressure

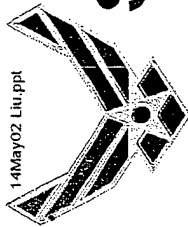




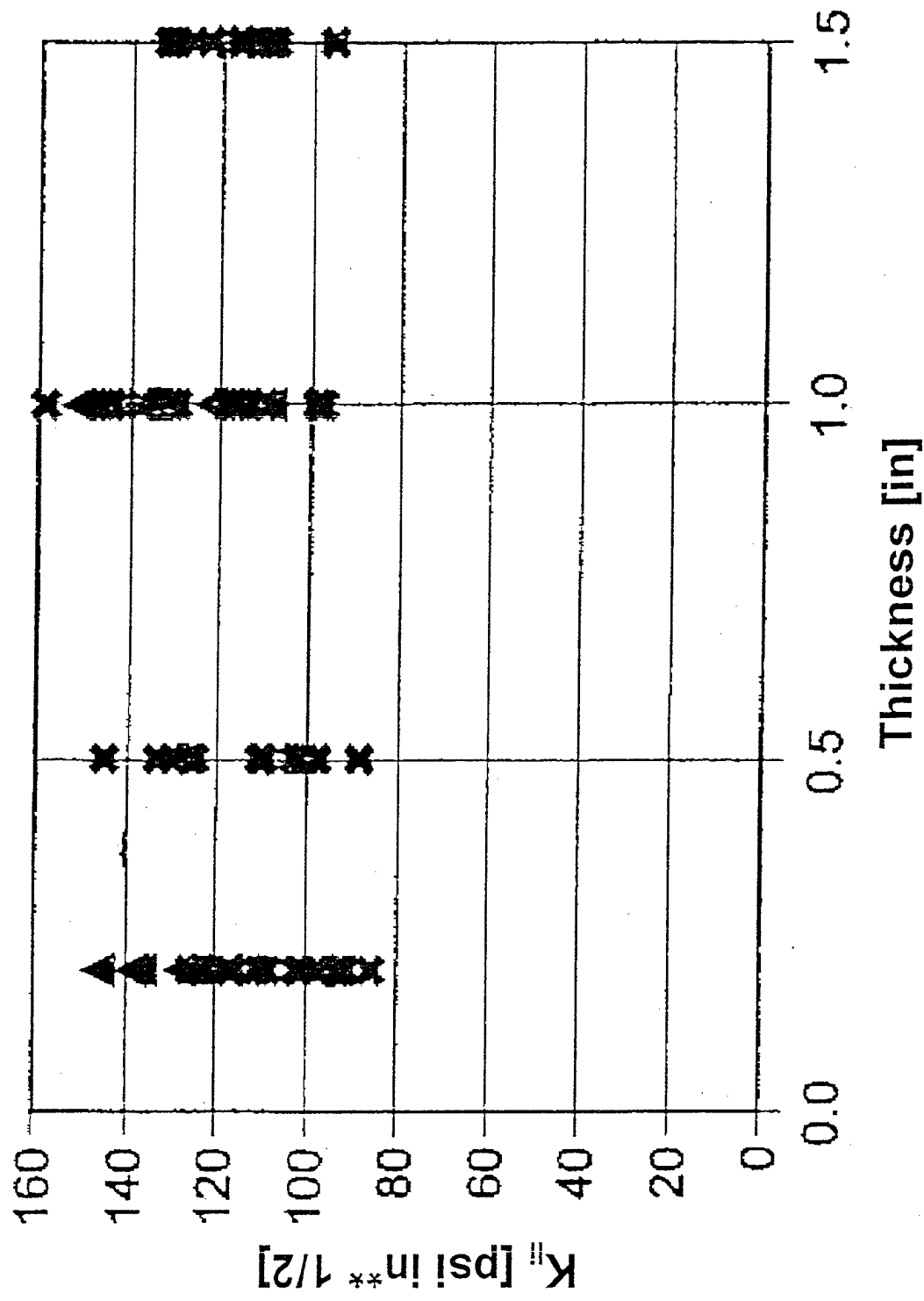
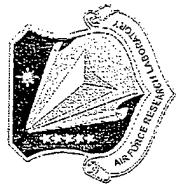
14May02 Liu.ppt

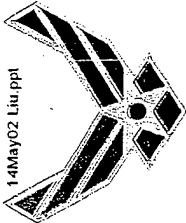
Mode I Stress Intensity Factor vs. Specimen Thickness (Ambient Pressure)



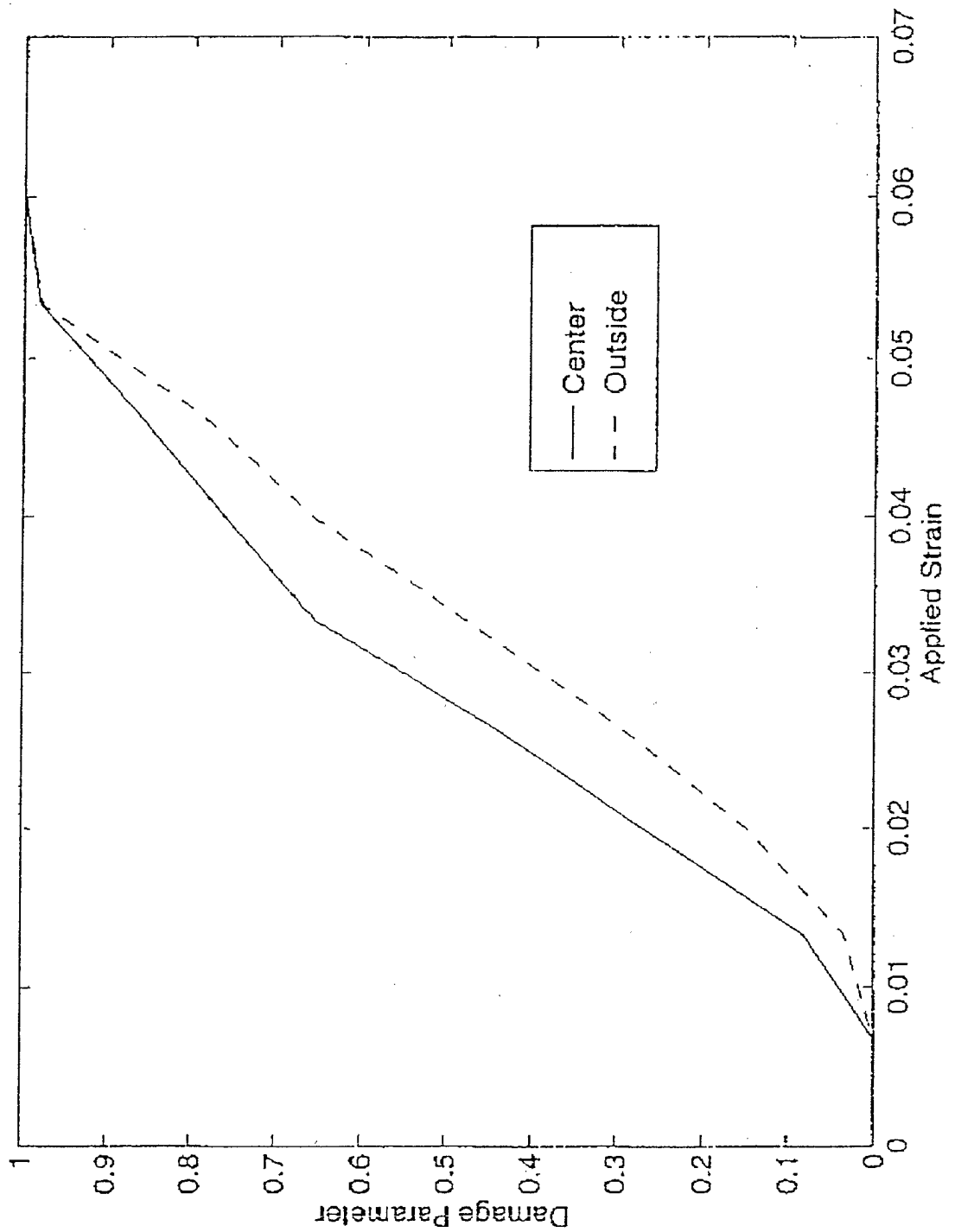
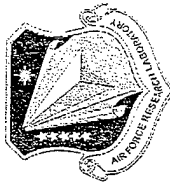


Mode I Stress Intensity Factor vs. Specimen Thickness. (1000 psi Pressure)





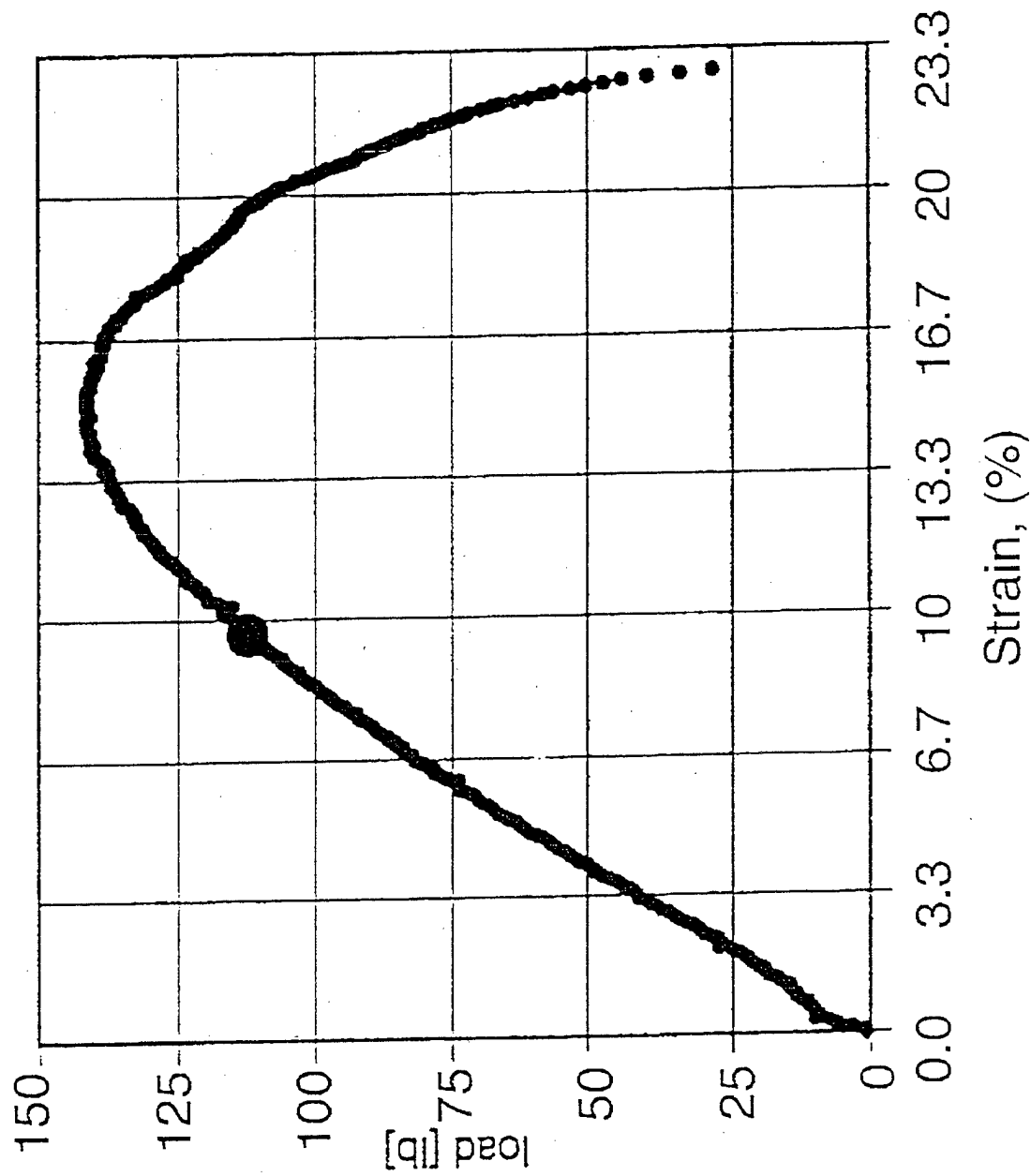
Damage Distribution near the Center and the Surface of the Specimen

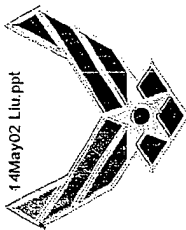




14May02 Litu.ppt

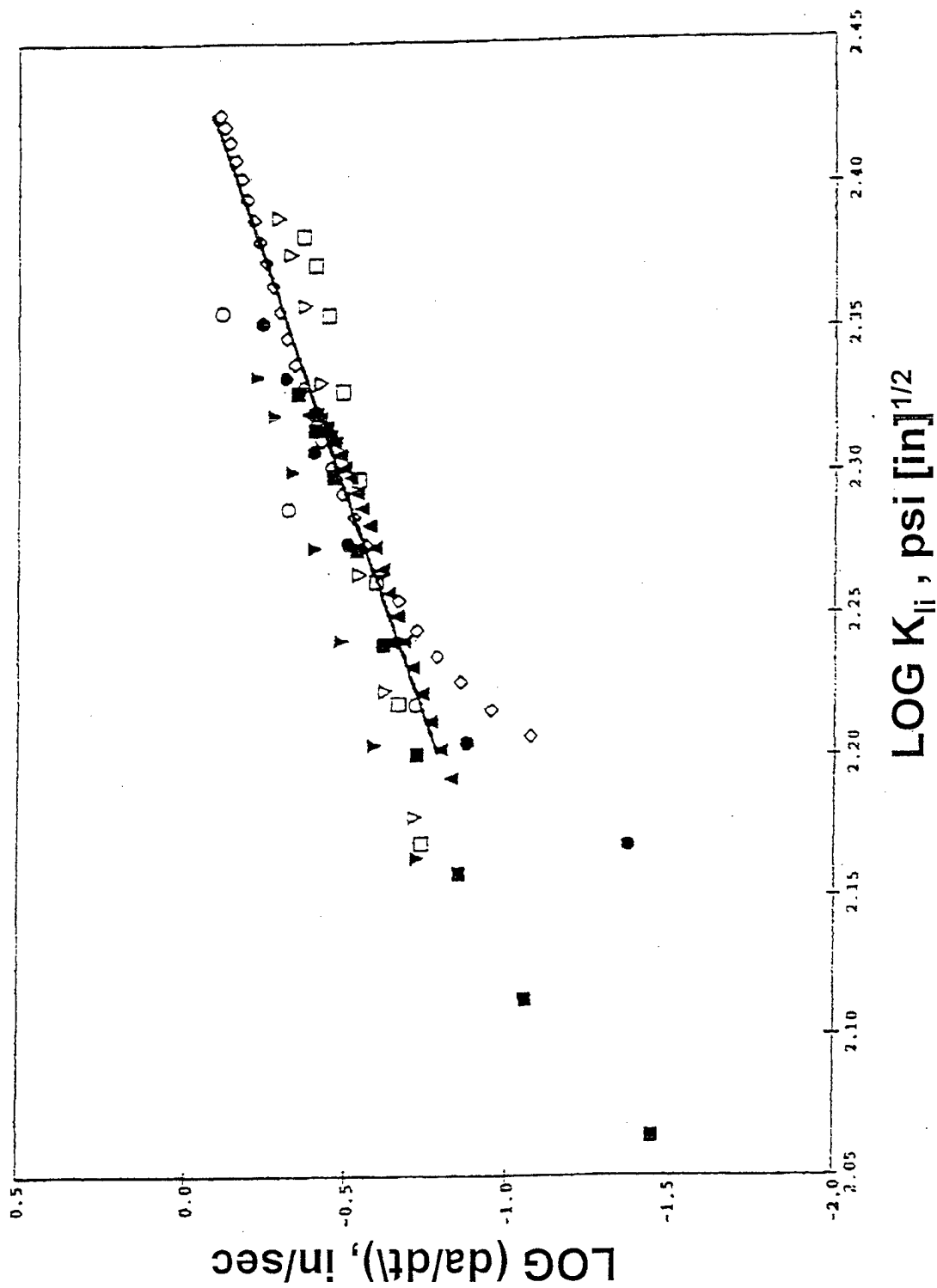
Stress-Strain Curve under 1000 psi Pressure

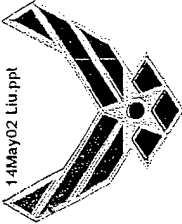




14May02 Llu.ppt

Crack Growth Rate vs. Mode I Stress Intensity Factor

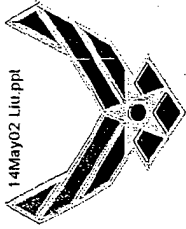




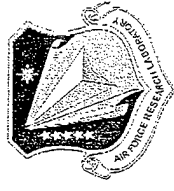
Conclusions



1. The critical Mode I stress intensity factor, K_{II} , for the onset of crack growth is insensitive to the specimen's thickness.
2. Plane strain fracture toughness does not exist for this material.
3. Brittle fracture occurs under ambient pressure, whereas a considerable amount of stable crack growth occurs under 1000 psi confined pressure.
4. A power law relationship exists between the crack growth rate and the Mode I stress intensity factor.



Objectives



- Investigate the Effects of Specimen Thickness and Confined Pressure on the Crack Growth Behavior of a Particulate Composite.
- Specimen Thickness (in.): 0.2, 0.5, 1.0, 1.5.
- Confined Pressure (psi): Ambient, 1000.